



Safer Salad Is "In the Bag"

Bagged salads are one of the most popular items in the fresh produce section of supermarkets today. The major reason: Salads are healthy foods. They help consumers meet the recommended quota of five servings each day of fruits and vegetables to maintain good health. Sales of packaged lettuce in the United States were over \$1.2 billion in 1997.

From a food safety perspective, salads are considered by some to be among the safest foods.

However, some segments of our population often exclude salads and other uncooked fruits and vegetables from their diets. Because of the high levels of microbial agents found on fresh-cut produce, salads are often not recommended for the young, old, pregnant, or immunocompromised. These people can't risk exposure to microorganisms that, for the general population, are normally considered nonpathogenic.

For even though commercial food processors use chlorine to control microbes on fresh-cut lettuce, the treatment doesn't eliminate all the organisms that can be present, such as *Shigella* and *E. coli* 0157:H7. Although *E. coli* is primarily found on meat, it has recently shown up in apple juice, sprouts, and lettuce. Outbreaks of food poisoning from *Shigella* on iceberg lettuce have occurred in Sweden, England, and Wales.

Robert D. Hagenmaier, an ARS chemist at the U.S. Citrus and Subtropical Products Laboratory in Winter Haven, Florida, has found a way to reduce these and other pathogenic and nonpathogenic microorganisms. He combines an ionizing irradiation treatment with the chlorine wash. Technician Kelly Alger assists with the research.

Ionizing radiation passes through food in the form of radiant energy, without leaving any residue. It does not make food radioactive. Although the U.S. Food and Drug Administration has approved up to 1 kilogray (kGy) of ionizing irradiation for fresh produce, Hagenmaier uses much less.

In lab experiments, he found that irradiation significantly reduced the microbial and yeast populations on cut iceberg lettuce. Eight days after zapping chlorine-washed lettuce with only 0.2 kGy of irradiation, microbial counts were 290 colony-forming units (CFU) and yeast, 60 CFU. Control samples that had not been irradiated showed microbial counts of 220,000 CFU and yeast, 1,400 CFU.

"Low levels of irradiation were used to minimize changes in the texture or appearance of the lettuce," Hagenmaier says.

Irradiated lettuce had about the same shelf life as untreated samples. Normal shelf life claimed by manufacturers for retail sales of salads is between 14 and 16 days from the packaging date.

Hagenmaier also irradiated chlorine-washed, shredded carrots in modified-atmosphere packaging. Nine days after irradiation, on the expiration date, the microbial count was 1,300 compared to 87,000 for nonirradiated, chlorinated controls, he says, and texture and appearance were unchanged.

"This research could help fresh-cut salads to be included in diets of people who otherwise couldn't enjoy them because of a potential microbiological health risk," Hagenmaier says.—By **Doris Stanley**, ARS.

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